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TRANSMITTAL FORM

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Filing Date	September 29, 2003
First Named Inventor	Janakiraman, Karthik
Art Unit	1763
Examiner Name	ZERVIGON, RUDY
Attorney Docket Number	016301-045510US

ENCLOSURES *(Check all that apply)*

- ☐ Fee Transmittal Form
  - ☐ Fee Attached
- ☐ Amendment/Reply
  - ☐ After Final
  - ☐ Affidavits/declaration(s)
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SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

Firm Name	Townsend and Townsend and Crew LLP		
Signature			
Printed name	Kent J. Tobin		
Date	April 19, 2007	Reg. No.	39,496

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I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Mail Stop Appeal Brief - Patents, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on the date shown below.

Signature	Sharyl Brown		
Typed or printed name	Sharyl Brown	Date	April 19, 2007

PATENT
Attorney Docket No.: A6378C1/T45510
AMAT No.: 006378 USA P01/DSM/PMD/JPFEIFFER
TTC File No.: 016301-045510US

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:	Confirmation No. 3855
Karthik Janakiraman et al.	Examiner: Rudy Zervigon
Application No.: 10/674,569	Technology Center/Art Unit: 1763
Filed: September 29, 2003	**APPELLANTS' BRIEF UNDER 37 CFR § 41.37**
For: GAS DISTRIBUTION SHOWERHEAD	

MAIL STOP APPEAL BRIEF - PATENTS
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Applicants, in the above-captioned patent application, appeal the final rejection of claims 1 and 3-5. The claims on appeal have been finally rejected pursuant to MPEP § 706.06(a). Accordingly, this appeal is believed to be proper.

I. REAL PARTY IN INTEREST

The real party in interest for the above-identified application is APPLIED MATERIALS, INC., having its principal place of business at P.O. Box 450A, Santa Clara, California 95052. Assignment of the instant application to APPLIED MATERIALS, INC. is recorded in the U.S. Patent and Trademark Office on September 29, 2003 at Reel 014574/Frame 0777.

II. RELATED APPEALS AND INTERFERENCES

There are no appeals or interferences related to the present appeal.

III. STATUS OF CLAIMS

Claims 1 and 3-5 are pending.

Claim 1 was finally rejected as anticipated under 35 U.S.C. § 102(e), based upon the grounds set forth in the Office Action mailed October 4, 2006.

Claims 1 and 3-5 were finally rejected as obvious under 35 U.S.C. § 103(a), also based upon the grounds set forth in the Office Action mailed October 4, 2006.

IV. STATUS OF AMENDMENTS

Applicants filed a Response on July 17, 2006 in reply to the Office Action mailed April 17, 2006. A Final Office Action mailed October 4, 2006 indicated that the Response did not place the application in condition for allowance. A copy of the claims involved in the appeal are contained in the Appendix attached hereto.

V. SUMMARY OF CLAIMED SUBJECT MATTER

Embodiments in accordance with the present invention relate to a gas distribution face plate having characteristics promoting uniform deposition of material on a substrate. As depicted schematically in FIG. 15A (reproduced below), the inventors observed that gases flowed through conventional showerheads (1500) having orifices (1500a) of widths of about 0.029 inches (29 mils), could result in formation of a material layer (1512) of uneven thickness, owing to different velocities of the gas at the center (V_C) versus edge (V_E) of the substrate:

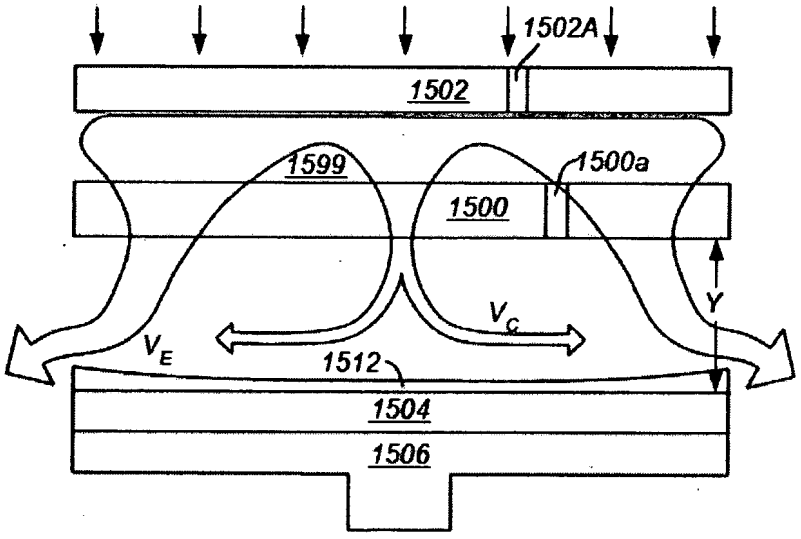


FIG. 15A

Accordingly, a new face plate design was proposed having orifices of narrower width of between about 0.010-0.018 inches (10-18 mils), in order to promote a uniform pressure drop across edge and center portions of the faceplate, and hence uniform gas velocities resulting in the deposition of a layer of uniform thickness. The results are shown in FIG. 16 (reproduced below):

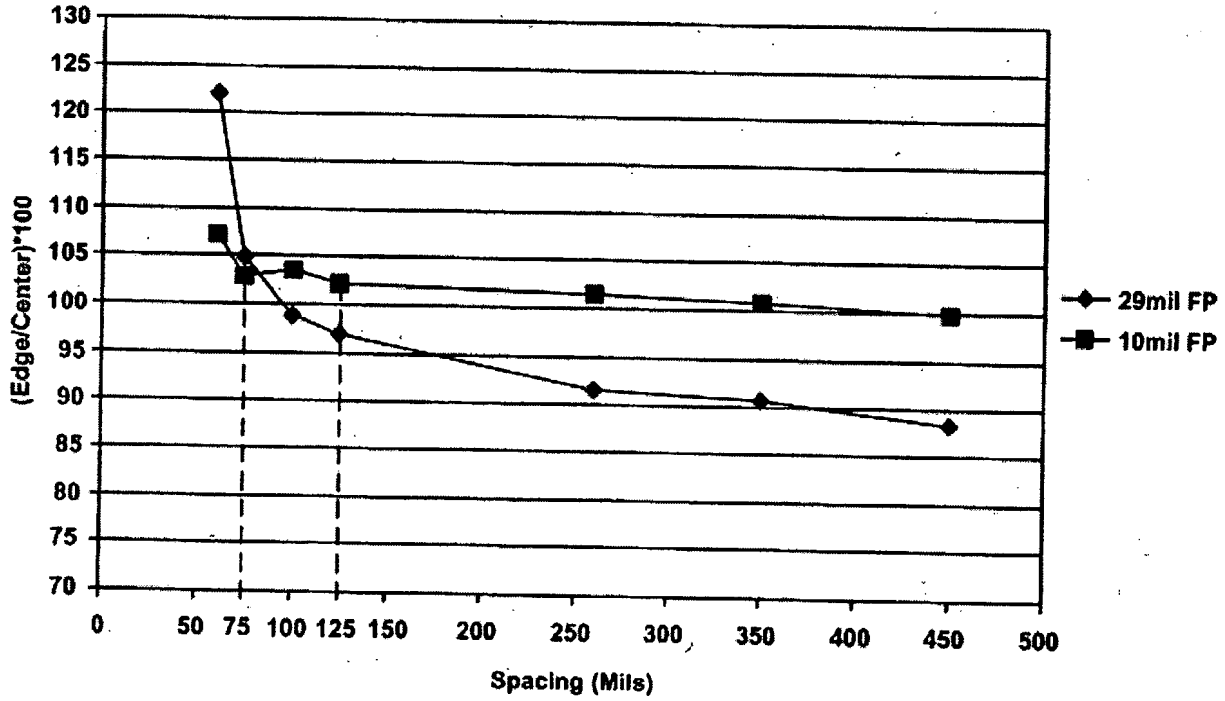


FIG. 16

FIG. 16 reveals that films formed by gas flows through the novel (■) faceplate (FP) having orifices of width of 10 mils (0.010"), exhibited superior uniformity as compared with films formed by gas flows through a conventional (♦) faceplate (FP) having orifices of width of 29 mils (0.029"). In particular, the films deposited utilizing the novel faceplate exhibited less variation in thickness over a substantially wider range of faceplate-to-wafer spacings.

Moreover, FIG. 16 also shows a profound lack of predictability in the relationship between the two curves, particularly at narrow faceplate-to-wafer spacings. This unpredictability reflects the considerable time and effort required by the inventors to develop a faceplate having the desired characteristics.

Independent claim 1 accordingly recites as follows:

1. A gas distribution face plate comprising:

a face plate body having a thickness defining a number of inlet orifices having a width of between about 0.010" and 0.018" and a depth, at least one parameter selected from the number, the width, and the depth configured to create a uniform pressure drop of between about 0.8 and 1 Torr across edge and center regions of the faceplate as gas is flowed through the inlet orifices, whereby a thickness of material deposited at an edge of a wafer varies by 3% or less from a thickness of material deposited at a center of the wafer, when the wafer is separated from the face plate by a gap of between about 75 and 450 mils.

Remaining claims 3-5 depend from claim 1 and recite various other face plate parameters

3. The face plate of claim 1 wherein the number comprises between about 2000 and 17500 orifices.

* * *

4. The faceplate of claim 3 wherein the number comprises about 10000 and the face plate is configured to process a wafer having a diameter of about 300 mm.

* * *

5. The faceplate of claim 3 wherein the number comprises about 5000 and the face plate is configured to process a wafer having a diameter of about 200 mm.

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

A. Claim 1 stands rejected as anticipated under 35 U.S.C. § 102(e) by U.S. Patent No. 6,454,860 to Metzner et al. ("the Metzner Patent").

B. Claims 1 and 3-5 stand rejected as obvious under 35 U.S.C. § 103(a) in view of Japanese Patent Application No. 4[1992]-154116 to Toki et al. ("the Toki Application").

VII. ARGUMENT

A. Claim 1 is not anticipated by the Metzner Patent

As a threshold matter, claim 1 stands rejected as anticipated, and not merely obvious, in view of the Metzner Patent:

> [t]he distinction between rejections based on 35 U.S.C. 102 and those based on 35 U.S.C. 103 should be kept in mind. Under the former, the claim is anticipated by the reference. No question of obviousness is present. In other words, for anticipation under 35 U.S.C. 102, the reference must teach every aspect of the

> claimed invention either explicitly or impliedly. Any feature not directly taught must be inherently present. (Emphasis added; MPEP 706.02)

Here, the Metzner Patent contains no teaching, implicit or even implied, regarding each element of claim 1. For example, the Metzner Patent consistently teaches a showerhead structure exhibiting orifices having widths equivalent to, or even larger than, those of the conventional showerheads distinguished by the present invention:

> Inlet **291** is axially symmetric to aperture centerline **267** and could be cylindrically shaped with a diameter 247 of 0.028 inches. (Emphasis added; col. 10, lines 8-10)
>
> * * *
>
> inlet diameter **247** is less than outlet diameter **288** or inlet diameter **247** could be about one-third of outlet diameter **288** such as when a representative aperture **249** has an inlet diameter **247** of 0.028 inches . . . . (Emphasis added; col. 10, lines 34-38)
>
> * * *
>
> Utilizing the ratios above, representative dimensions for each of a plurality of apertures **249** in a representative showerhead **240** fabricated from aluminum having a thickness of about 0.5 inches are: an inlet diameter **247** of about 0.028 inches . . . . (Emphasis added; col. 10, lines 52-56)
>
> * * *
>
> Inlet **291** is axially symmetric to aperture centerline **267** and could be cylindrically shaped with a diameter **247** of 0.110 inches. (Emphasis added; col. 11, lines 4-5)
>
> * * *
>
> Given the above ratios, dimensions for each of a plurality of representative apertures **238** in an aluminum showerhead **240** having a thickness of about 0.4 inches are: an inlet diameter **247** of about 0.110 inches . . . . (Emphasis added; col. 12, lines 12-15)

There is absolutely no teaching or suggestion in the Metzner Patent, regarding use of inlet orifices of the widths recited by claim 1.

In the most recent office action, the Examiner asserted that the Metzner Patent disclosed the claimed range at col. 9 line 38 and at col. 9 lines 53-64. Careful review of the Metzner Patent, however, fails to reveal any disclosure of the claimed orifice widths, in the cited passages or anywhere else for that matter.

Specifically, at col. 9 line 38, the Metzner Patent describes attaching the shower head and blocker plate to the lid using fasteners. A col. 9, lines 53-64, the Metzner Patent generally introduces Figures 6 and 8. Neither passage teaches orifices having a particular width.

The Examiner may have intended to refer to col. 10 of the Metzner Patent. For example, ccl. 10, line 38 recites an orifice having a width of 28mils, as does col. 10, line 56. Such an orifice width is, however, characteristic of the conventional face plate that is recognized by, and specifically differentiated from, the present invention.

The remainder of the Metzner Patent teaches orifices having an even greater width (110mil.) (See col. 11, line 5, and col. 12, line 15). Such a large orifice width can hardly be understood to suggest the much smaller range of orifice widths claimed by Applicants.

Because the Metzner Patent fails to teach, explicitly or even impliedly, each and every element of the pending claims, it is respectfully asserted that the anticipation claim rejection has been overcome. Accordingly, for at least these reasons, continued maintenance of the anticipation claim rejections is improper, and these claim rejections should be withdrawn.

B. Claims 1 and 3-5 are not Obvious in View of the Toki Application

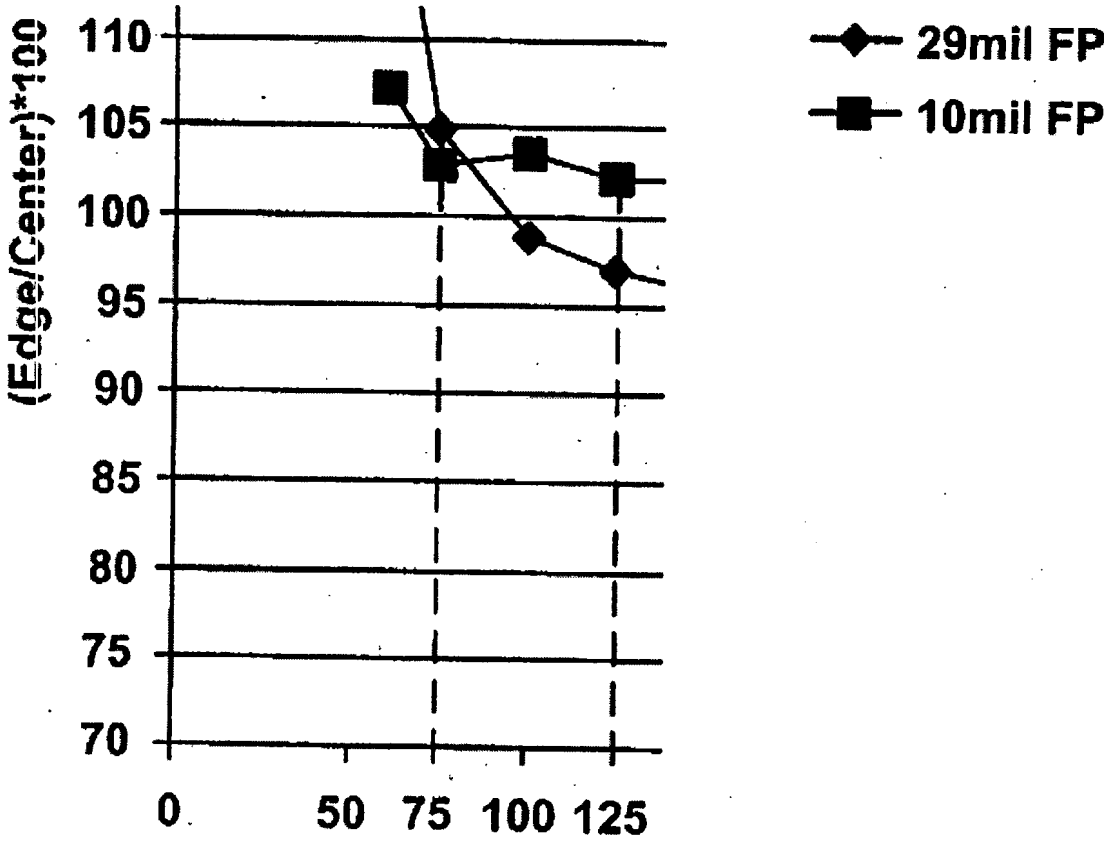
In order to establish a prima facie case of obviousness, "the prior art reference (or references when combined) must teach or suggest all of the claim limitations." (MPEP 2143).

Here, a complete English language translation of the Toki Application has been submitted for review by the Examiner. After reviewing this document, the Examiner openly concedes that the Toki Application fails to provide any teaching regarding many of the features of the claimed gas distribution shower head:

> Toki does not teach the wafer separation distance of 75 to 450 mils and the exact pressure drop of 0.8 and 1Torr range across the face plate body 21. Toki further does not teach his face plate body 21 with the number of orifices (25,26; Figure 1) between 2000 and 17,500 orifices and where said orifices have widths between 0.010 and 0.018 inches as claimed. . . . . (Emphasis added; Office Action Mailed October 4, 2006, page 4, lines 5-8)

Nevertheless, in maintaining final rejection of the claims, the Examiner simply asserts that it would have been obvious to one of ordinary skill to optimize the dimensions and number of inlet orifices to optimize the claimed film thickness variation.

Applicants vigorously dispute this conclusion. An enlarged portion of Figure 16 of the instant specification is reproduced below:



This portion of FIG. 16 of the instant application amply evidences the highly unpredictable correlation between orifice size and showerhead performance. In particular, a reduction in orifice width by approximately one-third (from 29mil to 10mil), does not result in a corresponding change in the edge-center variation of thickness of a deposited layer. Instead, FIG. 16 indicates that the curves are non-linear with respect to one another other, with this non-linearity increasing at closer face plate-to-wafer spacings.

This profound lack of predictability between orifice width and face plate performance demonstrated in FIG. 16, runs directly counter to any reasonable conclusion of obviousness. Rather than merely representing ordinary efforts at optimization, development of the claimed embodiments are the result of difficult and time-consuming experimentation involving a highly

complex and unpredictable chemical process. The art relied upon by the Examiner does not support a conclusion of obviousness, and the claim rejections should be withdrawn.

VIII. CONCLUSION

In view of the foregoing arguments distinguishing claims 1 and 3-5 over the art of record, Applicants respectfully submit that the claims are in condition for allowance, and respectfully request that the rejection of these claims be reversed.

Respectfully submitted,

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IX. CLAIMS APPENDIX

1. (Previously Presented) A gas distribution face plate comprising:

a face plate body having a thickness defining a number of inlet orifices having a width of between about 0.010" and 0.018" and a depth, at least one parameter selected from the number, the width, and the depth configured to create a uniform pressure drop of between about 0.8 and 1 Torr across edge and center regions of the faceplate as gas is flowed through the inlet orifices, whereby a thickness of material deposited at an edge of a wafer varies by 3% or less from a thickness of material deposited at a center of the wafer, when the wafer is separated from the face plate by a gap of between about 75 and 450 mils.

2. (Canceled)

3. (Original) The face plate of claim 1 wherein the number comprises between about 2000 and 17500 orifices.

4. (Original) The faceplate of claim 3 wherein the number comprises about 10000 and the face plate is configured to process a wafer having a diameter of about 300 mm.

5. (Original) The faceplate of claim 3 wherein the number comprises about 5000 and the face plate is configured to process a wafer having a diameter of about 200 mm.

6-18. (Canceled).

X. EVIDENCE APPENDIX

None.

XI. RELATED PROCEEDINGS APPENDIX

None.